

# PATENT ABSTRACTS OF JAPAN

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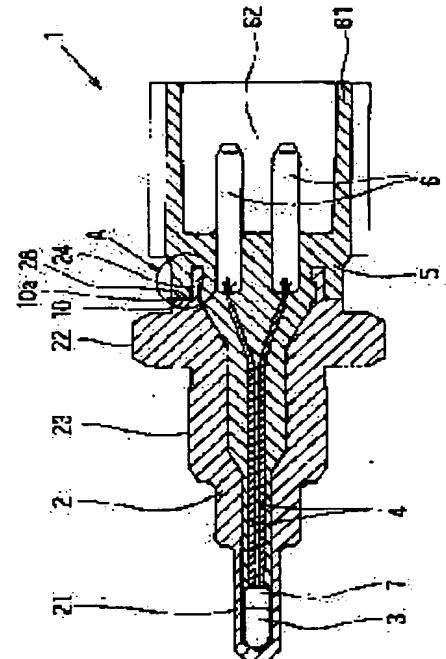
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**(54) TEMPERATURE SENSOR**

(57) Abstract:

**PROBLEM TO BE SOLVED:** To provide a structure capable of preventing water from intruding the boundary surface between a metal case and a resin part without complicating a manufacturing process in a temperature sensor having a thermistor sealed in the metal case with resin.

**SOLUTION:** The metal case 2 is provided with a cylindrical part 24 projected to be enclosed in the resin part 5 at the end part 28 of an opening part, and the cylindrical part 24 has a projecting part 24a on the inside of its forward end part. In this arrangement, even if the metal case 2 or the resin case 5 expands or shrinks due to an environmental temperature change, a difference in coefficient of expansion between them causes one face of the cylindrical part 24 having the projecting part 24a to closely adhere to the resin part 5, so that no air layer is formed on the boundary surface 10. Thus, entering of water from the boundary surface 10 between the metal case 2 and the resin part 5 can be prevented without specially providing a process of forming a waterproof structure.



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## CLAIMS

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## [Claim(s)]

[Claim 1] While connecting with the metal casing (2) of the cylinder-like-object-with-base configuration which has opening so that lead wire (4) may be drawn from said opening side While filling up in said metal casing (2) so that the temperature sensing element (3) contained by the pars basilaris ossis occipitalis within said metal casing (2) and said temperature sensing element (3) may be closed In the temperature sensor which has the resin section (5) which extended to the edge (28) of said opening said metal casing (2) It is the temperature sensor which has the annular lobe (24) which projects in shaft orientations from the edge (28) of said opening, and is characterized by having covered said resin section (5) so that the front face of said lobe (24) may be surrounded.

[Claim 2] Said lobe (24) is a temperature sensor according to claim 1 which has the annular heights (24a) which project in the direction of a path of said metal casing (2), and is characterized by said resin section (5) having covered said heights (24a).

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## DETAILED DESCRIPTION

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### [Detailed Description of the Invention]

[0001]

[Field of the Invention] Especially this invention relates to the temperature sensor which closed the temperature sensing element by resin in metal casing about a temperature sensor.

[0002]

[Description of the Prior Art] The temperature sensor of the structure which has arranged the thermistor which has lead wire at the pars basilaris ossis occipitalis of the metal casing of the shape of a cylinder like object with base arranged in device under tests, such as cooling water, as a temperature sensor used for measurement of the cooling water temperature for automobiles etc., for example, was filled up with resin in metal casing, and closed the thermistor in this resin section from the former is known.

[0003] In the case of this type of temperature sensor, when the metal casing and the resin section from which a coefficient of thermal expansion differs carried out expansion contraction by environmental temperature change of fluctuation of cooling water temperature etc., the air space was formed in the interface of metal casing and the resin section, and there was a case where the air and waterdrop which have humidity along an interface permeated.

[0004] When even the part which moisture permeated from the interface and has arranged the thermistor is arrived at, there is a problem that leak occurs in thermistor lateral root Motobe of lead wire, and cannot output exact resistance or an open circuit of lead wire occurs by electric corrosion.

[0005] While arranging the thermistor which carried out closing thermistor lateral root Motobe of lead wire by resin etc. like the temperature sensor of a utility model registration official report [ for example, / No. 2520903 ] publication as this cure, and formed waterproof construction at the pars basilaris ossis occipitalis of metal casing, the temperature sensor of the structure in which the resin section was formed is known.

[0006]

[Problem(s) to be Solved by the Invention] However, with the above-mentioned conventional technique, in order to form waterproof construction, there is a problem that a production process becomes complicated.

[0007] This invention was made in view of the point describing above, and it aims at offering the temperature sensor which can prevent that moisture permeates from the interface of metal casing and the resin section, without complicating a production process.

[0008]

[Means for Solving the Problem] In order to attain the above-mentioned object, in invention according to claim 1 While connecting with the metal casing (2) of the cylinder-like-object-with-base configuration which has opening so that lead wire (4) may be drawn from an opening side While filling up in metal casing (2) so that the temperature sensing element (3) contained by the pars basilaris ossis occipitalis within metal casing (2) and a temperature sensing element (3) may be closed In the temperature sensor which has the resin section (5) which extended to the edge (28) of opening metal casing (2) It has the annular lobe (24) which projects in shaft orientations from the edge (28) of opening, and the resin section (5) is characterized by having covered so that the front face of a lobe (24) may be surrounded.

[0009] According to this, the lobe (24) of metal casing (2) is located in the resin section (5), and is enclosed by the resin section (5). Therefore, even if metal casing (2) and the resin section (5) carry out expansion contraction by environmental temperature change, when those expansion coefficients differ, one field (24b, 24c, 24d, 24e) of the lobes (24) of metal casing (2) is stuck with the resin section (5), and does not form an air space in an interface (10).

[0010] Thus, it can prevent that moisture permeates from the interface (10) of metal casing (2) and the resin section (5), without establishing specially the process which forms waterproof construction.

[0011] Moreover, in invention according to claim 2, a lobe (24) has the annular heights (24a) which project in the direction of a path of metal casing (2), and is characterized by the resin section (5) having covered heights (24a).

[0012] According to this, even if metal casing (2) and the resin section (5) carry out expansion contraction by environmental temperature change in the shaft orientations of cartridge-like metal casing (2), when those expansion coefficients differ, one field (24d, 24e) of the heights (24a) established annularly is stuck with the resin section (5), and does not form an air space in an interface (10). Moreover, when the corner is formed at the head of heights (24a), the planar pressure of a corner becomes high at the time of adhesion with metal casing (2) and the resin section (5). Therefore, it is much more hard to form an air space.

[0013] Thus, it can prevent certainly that moisture permeates from the interface of metal casing (2) and the resin section (5), without establishing specially the process which forms waterproof construction.

[0014] In addition, the sign in the parenthesis given to each above-mentioned means shows response relation with the concrete means given in an operation gestalt mentioned later.

[0015]

[Embodiment of the Invention] Hereafter, the gestalt of operation of this invention is explained based on drawing.

[0016] Drawing 1 is the sectional view of the temperature sensor 1 which applied this invention.

[0017] As shown in drawing 1, the temperature sensor 1 equips the method side of drawing 1 Nakamigi with the metal casing 2 of the shape of a cylindrical shape which has opening. While this metal casing 2 has the thin protecting tube section 21 in a pars-basilaris-ossis-occipitalis side, the hexagon-head section 22 which turns into the receptacle section of the tool for bolting at the time of temperature sensor anchoring is formed in the method side periphery of drawing Nakamigi.

[0018] The male screw section 23 for screwing on the screw-thread hole of cooling water runoff piping of a water cooled engine is formed in the left side periphery of the hexagon-head section 22 of metal casing 2. in addition -- < -- A HREF -- = -- " -- / -- Tokujitu/tjitemdrw . -- ipdl?N -- 0000 -- = -- 237 -- & -- N -- 0500 -- = -- one -- E\_N -- / -- ; -- > -- ; -- = -- 98 -- : -- ; -- ? -- / -- / -- & -- N -- 0001 -- = -- 101 -- & -- N -- 0552 -- = -- nine -- & -- N -- 0553 -- = -- 000003 -- " -- TARGET -- = -- "tjitemdrw" -- > -- drawing 1 -- R -- > -- one -- setting -- a male screw -- the section -- 23 -- a screw thread -- a configuration -- a graphic display -- omitting -- \*\*\* -- . Moreover, the body 24 which is an annular lobe is formed in the edge (method side edge section of drawing Nakamigi) 28 of opening of metal casing 2. A body 24 is explained in full detail later.

[0019] With this operation gestalt, metal casing 2 is a case made from brass. In addition, the construction material of metal casing 2 should just be a metallic material equipped not only with brass but desired thermal conductivity, reinforcement, a resistance to environment, etc.

[0020] In the protecting tube section 21 of metal casing 2, the glass closure thermistor 3 of the common knowledge which is a temperature sensing element is arranged. This glass closure thermistor 3 is closed by the resin section 5 with the lead wire 4 of the couple which is connected to the thermistor component which constitutes this, and which is not illustrated, and is pulled out from the glass closure thermistor 3, and is being fixed in metal casing 2.

[0021] With this operation gestalt, lead wire 4 has adopted as the periphery of a metallic conductor the lead wire which has the coat of a polyimide tube. In addition, as long as the coat of lead wire 4 has a desired insulating property, thermal resistance, etc., it may be a fluororesin tube etc.

[0022] Moreover, in order to protect near the bottom of the drawer section from the glass closure thermistor 3 of lead wire 4 from external force to the method of drawing Nakamigi of the glass closure thermistor 3, welding of the ceramic member 7 which has two lead-wire breakthroughs is carried out to the glass closure thermistor 3.

[0023] The resin section 5 forms the connector area 61 in the opening side of metal casing 2 by itself, and the terminal 6 of the couple connected with the above-mentioned lead wire 4 by spot welding projects in the dead air space 62 for socket insertion of a connector area 61.

[0024] In the temperature sensor 1 of the above-mentioned configuration, since the resistance of the thermistor component in the glass closure thermistor 3 changes with temperature, if a current is passed between the terminals 6 of a couple, according to the temperature of the device under test (this example engine cooling water) transmitted through the protecting tube section 21, the voltage drop value between terminals 6 will change. It can convert from this voltage drop value, and the temperature of a device under test can be known.

[0025] Moreover, in order to manufacture the temperature sensor 1 of the above-mentioned configuration,

the metal casing 2 processed into the above-mentioned configuration by cutting and the terminal 6 which connected the glass closure thermistor 3 through lead wire 4 are first set in the cavity of metal mold. And after mold clamp carrying out of the metal mold, in a cavity, resin is injection molded and a temperature sensor 1 is obtained. In addition, with this operation gestalt, 66 Nylon which contains a glass fiber 30% is adopted as a resin ingredient which forms the resin section 5. In addition, a resin ingredient should just have reinforcement, a resistance to environment, etc. of not only this but a request.

[0026] Next, the body 24 which is an important section of this invention is explained.

[0027] Drawing 2 is the sectional view having expanded and shown the A section shown in drawing 1.

[0028] The body 24 is formed in the edge 28 of opening of metal casing 2, and it is prepared so that it may project in the shaft orientations of metal casing 2 in the resin section 5. Moreover, the body 24 has heights 24a which continues in the shape of [ which projects toward the method of the inside of the direction of a path of metal casing 2 in the point ] a periphery. Therefore, as shown in drawing 2, the whole of each field of a body 24 touches the resin section 5, and the body 24 is formed so that it may be enclosed by the resin section 5.

[0029] In this structure, since the coefficient of thermal expansion of the resin which forms the resin section 5 is larger than the coefficient of thermal expansion of the metal which forms metal casing 2, when the temperature of a temperature sensor 1 becomes an elevated temperature, the resin section 5 expands rather than metal casing 2, and the resin section 5 is certainly stuck to inner skin 24b of a body 24 and 24d of Uchihira sides shown in drawing 2. Moreover, when the temperature of a temperature sensor 1 becomes low temperature, the resin section 5 contracts rather than metal casing 2, and the resin section 5 is certainly stuck to peripheral face 24c and end-face 24e of the body 24 shown in drawing 2.

[0030] Furthermore, when the resin section 5 sticks to inner skin 24b of a body 24, and 24d of Uchihira sides at the time of an elevated temperature, there is an inclination for the direction of the planar pressure of 24f of corners between the fields stuck rather than each stuck fields 24b and 24d to become high. Moreover, when the resin section 5 sticks to peripheral face 24c and end-face 24e of a body 24 at the time of low temperature, there is an inclination for the direction of the planar pressure of 24g of corners between the fields stuck rather than each stuck fields 24c and 24e to become high.

[0031] According to the above-mentioned configuration and the mechanism, even if the metal casing 2 and the resin section 5 from which a coefficient of thermal expansion differs may carry out expansion contraction by environmental temperature change, it can prevent that moisture infiltrates into the interface 10 of metal casing 2 and the resin section 5 from interface edge 10a.

[0032] In addition, artificers are checking that it is immersed to the location where interface edge 10a hides into the liquid which placed upside down the left which shows the temperature sensor 1 of this operation gestalt to drawing 1, and was colored, carry out a cold energy cycle trial (0 degree C and 120 degrees C) in this condition, and the colored liquid does not permeate even inside metal casing 2.

[0033] Moreover, in order to form waterproof construction, it is not necessary to prepare the member of dedication. Since it furthermore is not necessary to establish the production process of dedication for waterproof construction formation, a production process does not become complicated.

[0034] (Other operation gestalten) In a up Norikazu operation gestalt, as shown in drawing 3, it may be prepared in the point inside and the outside of a body 24, and although heights 24a was prepared inside [ point ] the body 24, as shown in drawing 4, it may be prepared only in the outside of the point 24 of a body 24. In addition, artificers are checking that the liquid which carried out the same cold energy cycle trial as a up Norikazu operation gestalt, and was colored also in these two examples does not permeate even inside metal casing 2.

[0035] Moreover, in a up Norikazu operation gestalt, although heights 24a was prepared inside [ point ] the body 24, it may be prepared in the inner surface of metal casings 2 other than body 24.

[0036] Moreover, in a up Norikazu operation gestalt, although the temperature sensor 1 detected engine cooling water temperature, it cannot be overemphasized that it is applicable to temperature detection of other device under tests, such as oil.

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## \* NOTICES \*

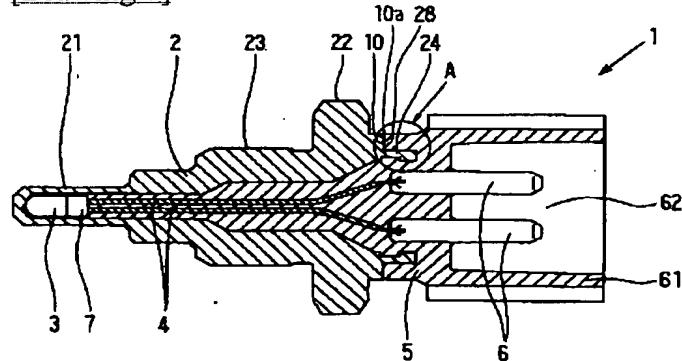
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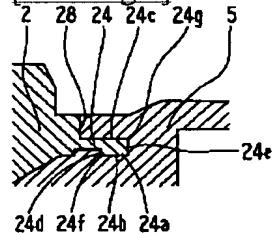
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DRAWINGS

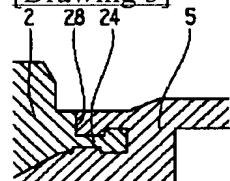
[Drawing 1]



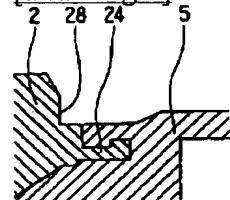
[Drawing 2]



[Drawing 3]



[Drawing 4]



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